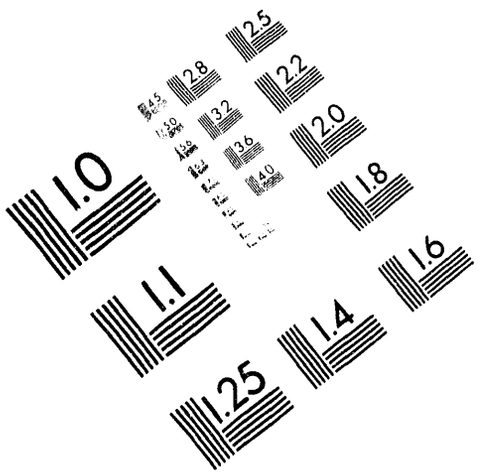

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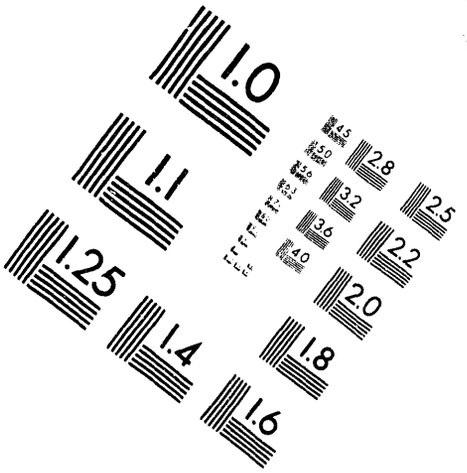

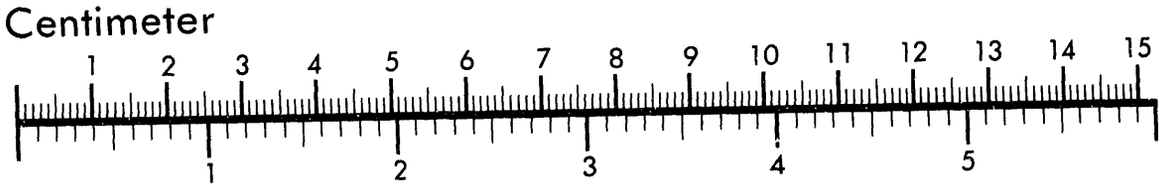

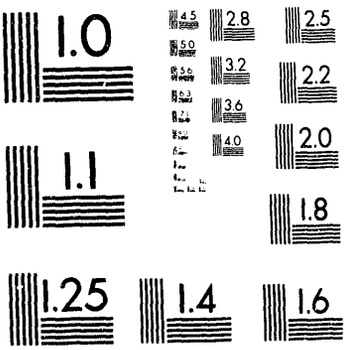

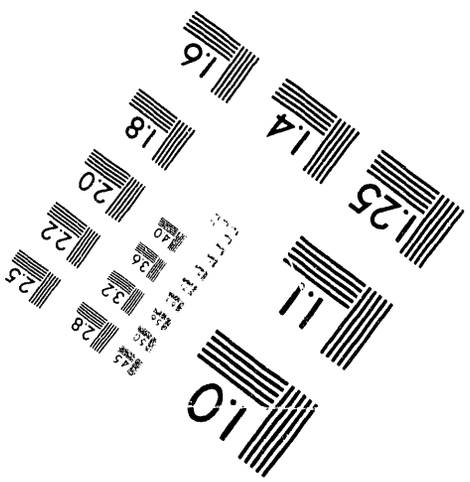

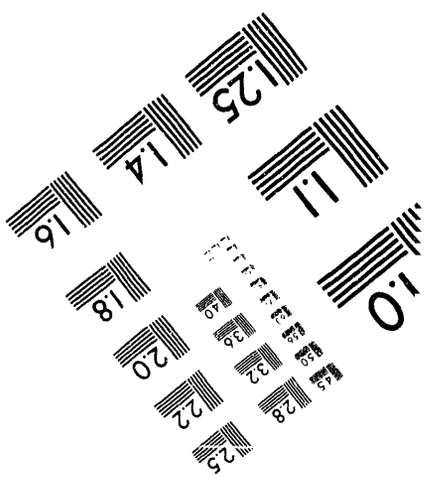

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THE ATMOSPHERIC RELEASE ADVISORY CAPABILITY SITE WORKSTATION SYSTEM

By

K.T. Foster, D.A. Sumikawa, and C.S. Foster

University of California
Lawrence Livermore National Laboratory
Livermore, California

and

R.L. Baskett

EG&G Energy Measurements, Inc.
Pleasanton, California

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THE ATMOSPHERIC RELEASE ADVISORY CAPABILITY SITE WORKSTATION SYSTEM

INTRODUCTION

The Atmospheric Release Advisory Capability (ARAC) is a centralized emergency response service that assesses the consequences that may result from an atmospheric release of toxic material. ARAC was developed by the Lawrence Livermore National Laboratory (LLNL) for the Departments of Energy (DOE) and Defense (DOD) and responds principally to radiological accidents. ARAC provides radiological health and safety guidance to decision makers in the form of computer-generated estimates of the effects of an actual, or potential release of radioactive material into the atmosphere.

Upon receipt of the release scenario, the ARAC assessment staff extracts meteorological, topographic, and geographic data from resident world-wide databases for use in complex, three-dimensional transport and diffusion models. These dispersion models generate air concentration (or dose) and ground deposition contour plots showing estimates of the contamination patterns produced as the toxic material is carried by the prevailing winds.

To facilitate the ARAC response to a release from specific DOE and DOD sites and to provide these sites with a local emergency response tool, a remote Site Workstation System (SWS) is being placed at various ARAC-supported facilities across the country. This SWS replaces the existing antiquated ARAC Site System now installed at many of these sites. The new system gives users access to complex atmospheric dispersion models that may be run either by the ARAC staff at LLNL, or (in a later phase of the system) by site personnel using the computational resources of the SWS. Supporting this primary function are a variety of SWS-resident supplemental capabilities that include meteorological data acquisition, manipulation of release-specific databases, computer-based communications, and the use of a simpler Gaussian trajectory puff model that is based on Environmental Protection Agency's INPUFF code.

SOFTWARE CAPABILITIES

The input for the atmospheric dispersion models is derived from the SWS accident scenario Questionnaire (which is a collection of user-entered, release-specific information) and from local meteorological data supplied either directly by the user or by connection to data acquisition equipment. The Questionnaire application prompts users for the necessary release information. This includes the time and location of the release, the radionuclides and amount released, the initial cloud geometry, and a categorization of the local surface characteristics. This information, at the discretion of the user, is then either forwarded to ARAC or used locally for input to the SWS-resident dispersion models. Local

meteorological data may be used either by ARAC (to supplement the regional data collected from other sources) or by the SWS user to fulfill the needs of any user-operated dispersion model. These data (whether collected from an instrumented tower/other platform or entered by the user) may be displayed to the user in a list or graphical format.

The output from available atmospheric dispersion models may be displayed and printed, whether the model results were generated locally on the SWS or were generated at ARAC and transferred to the workstation. These model results, depending on their application, may be from simpler Gaussian codes or from complex three-dimensional particle-in-cell dispersion models. In cases where SWS users want minimal SWS-resident modeling capability (due to a lack of trained site personnel), a trajectory puff Gaussian model is supplied. Input to the Gaussian model is derived from the Questionnaire information and from either the SWS meteorological database or from user-specified wind and stability conditions. The user can manipulate the scale and position of the resulting concentration (or dose) contours, which overlay a geographic representation of the affected area, through the use of pan and zoom capabilities. This Gaussian model was designed to generate results with no more than one minute of calculation time. It may therefore be used as the first available dispersion model tool to plan the local emergency response.

The full LLNL-resident capabilities of ARAC are also available to the SWS user. Upon notification from an SWS user, through telephone-line transfer of the Questionnaire information, dispersion calculations using much more complex modeling techniques can be completed at ARAC. The results of these calculations can then be transferred, within approximately 15 minutes, back to the appropriate SWS platforms for use in the emergency response. The SWS user selects the ARAC-generated gridded concentration data to contour for display or printing, from a list of those pertaining to the current incident. Since the SWS receives these model results in gridded format, future SWS capabilities may include the flexibility to recontour or further manipulate the results to meet the evolving requirements of the user.

For those sites with trained personnel who want an independent advanced dispersion assessment capability, the more complex models can be placed on the SWS. These models, including some currently under development, will feature gradient and Monte Carlo diffusion algorithms driven by diagnostic and prognostic wind fields.

Other SWS software subsystems include a number of user-editable databases that allow each system to be tailored to the needs and wants of each SWS site location. These databases permit users to specify a wide range of system characteristics and to pre-set likely accident scenarios. Through access to the Preferences Database, users may specify the display units and formats for the various system and application parameters. Users also control system performance characteristics such as an optional automatic print of newly received ARAC model products. Several other databases allow the user to pre-load accident scenario information likely to be needed during a future response to an actual release. This information is easily retrievable at the time of a release for entry into the system accident scenario Questionnaire.

SYSTEM REQUIREMENTS

The SWS was designed for use on a RISC-based workstation class machine. The suggested configuration includes a 19-in. color monitor, 32 megabytes of memory, and a 1 Gigabyte hard disk. Peripheral equipment includes a black and white or color Postscript laser printer, 4-mm tape backup, and 9,600-baud modem for communications with the ARAC center. Dial-up or leased-line modem communication can also be used for local meteorological data acquisition from one or more optional instrumented towers or other meteorological data sources.

The SWS software is designed for the UNIX operating system, and provides a user-interface built on the X-windowing system and the OSF/Motif graphical user interface. The varied SWS applications were designed to meet the needs of a diverse user community, which includes those experienced with computers and atmospheric modeling as well as those needing access to sophisticated models as part of a distributed network of computer resources.

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